US Army Corps of Engineers

DCAF Bulletin

Design Construction Analysis Feedback

No. 95-05

Date: 23 October 1995
Expires 31 December 1997

CEMP-CE

SUBJECT: Installation and Testing of Preapproved Underground Heat Distribution Systems

Applicability: Information

REFERENCES: EIRS Bulletin 91-05, CEGS 02695, Draft Report "Investigation of Preapproved Underground Heat Distribution Systems", Construction Bulletin 91-14.

1. The Federal Agency Committee (FAC), which has jurisdiction over preapproved conduit type underground heat distribution systems, recently sponsored an extensive field investigation to ascertain the condition of existing systems. This investigation was performed by the Engineering and Materials Division of the U.S. Army Construction Engineering Research Laboratories (USACERL).

2. The inspection team evaluated 35 systems on 15 different DOD and Department of Veterans Affairs installations. One of the main objectives of the overall approach of this investigation was to obtain a representative sampling of all of the systems currently in use at FAC member agency sites within the continental United States. A summary of the results of the investigation follows.

a. Many systems were not installed in accordance with criteria. Steam and condensate lines are installed in a common conduit. Branch connections were occasionally found at other than manhole or building locations.

b. Conduit drain plug was occasionally found to be missing, allowing water to enter the conduit if the manhole filled with water. Steel drain plugs rather than brass were occasionally found. In a typical manhole environment corrosion will cause steel drain plugs to be unable to be removed.

c. Runs between manholes exceeded 500 feet. Long runs make leak detection difficult and lead to either excessive burial depth or improper slope.

d. Conduit vents were plugged on some systems. Vent steaming is used as an indication of water infiltration into the conduit.

e. Contractors are not providing a Certificate of Compliance furnished by the system suppler.

f. At many locations copies of the system supplier's representative field reports could not be located.

g. Virtually all gland seals encountered required tightening before a conduit air pressure

test could be attempted.

2. The survey's results indicate that direct buried conduit systems have not performed as anticipated. New Army policy requires the use of aboveground or shallow concrete trench heat distribution systems where practicable. However, due to aesthetics or site conditions, direct buried systems will be required in some projects. The survey indicates that the conduit systems with the best performance are steel conduit systems with fixed end seals (no gland seals). Army policy now only allows these types of conduit systems. Direct buried conduit systems are more sensitive to both design and construction errors than conventional building construction. Each item listed above is commonly found during site inspections and can lead to a shortened life for an underground heat distribution system. The comments below will address each item listed above in order as to the contract and approved brochure requirements for underground heat distribution systems. The approved brochure indicates that the supplier's preapproved system is approved for use for the site classification and the operating temperature and pressure indicated. The brochure provides complete design, hardware, installation, maintenance, repair and quality control requirements for a system manufacturer's preapproved underground heat distribution system.

a. Steam and condensate lines shall be in separate conduits. High temperature hot water supply and return lines may be in a common conduit. Steam piping shall be designed and installed for minimum slope of 1 inch in 20 feet in the direction of flow. Other piping shall be pitched the same toward drain points. All branch connections shall be made in manholes or buildings unless specified otherwise.

b. Conduit drain shall have a brass plug, see enclosure 1.

c. Manholes shall be installed where required. Manholes are required at least every 500 feet for steam systems unless site conditions warrant otherwise. They shall be sized to provide adequate room for maintenance.

d. Conduit vent shall extend through manhole top, goose neck down and remain open, see enclosure ll.

e. A notarized statement (Certificate of Compliance), signed by a principal officer of both the manufacturing and contracting firms, certifying that the system has been installed satisfactorily and in accordance with the contract requirements, and approved brochure, shall be furnished upon completion of the work and before final acceptance.

f. The items of work, listed below, pertaining to the preapproved system shall be performed in the presence of the system supplier's representative, and a daily report is required from the representative. The report shall be checked for accuracy and the original presented no later than the next working day after the work has been performed. The report shall be signed by the representative. The report shall state whether or not the condition and quality of the materials used and the installation of the system are in accordance with the drawings, specifications and approved brochure. If anything connected with the installation is unsatisfactory, the report shall state what corrective action has been taken or shall contain the preapproved system supplier's recommendations for corrective action. The report shall cover the following items of work.

1. Inspection and unloading of materials.
2. Inspection of trench prior to laying of conduit.
3. Inspection of concrete thrust blocks prior to cold springing.
4. Cold springing.

5. Hydrostatic test of all service lines.
6. Field joint closure work.
7. Air test of conduit.
8. Repair of any coating patch work.
9. Holiday test of conduit coating.
10. Initial backfill up to 10 inches above the top of the casing.
11. The slope of the system. Elevation readings required will be witnessed and recorded.

The contractor shall not perform any of this work in the absence of the system supplier's representative.

g. Gland type end seals shall not be provided.

3. The items discussed above cover only a portion of the requirements for a complete underground heat distribution system. CEGS 02695, contract drawings and the system supplier's approved brochure provide complete design, hardware, installation, maintenance, repair, and quality control requirements. All approved brochures are prefaced by a Federal Agency Letter of Acceptability. To insure system success it is critical that the system be installed, inspected and tested in the presence of the system supplier's representative. Finally the Certificate of Compliance shall be furnished and signed by a principal officer of both the supplier and contracting firm, certifying that the system has been installed satisfactorily and in accordance with the contract requirements.

4. This DCAF has been coordinated with Engineering Division (CEMP-E).

Encls

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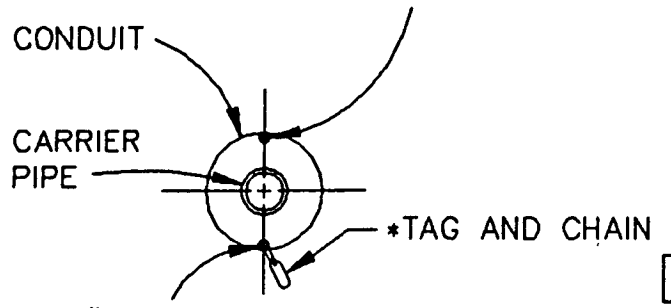
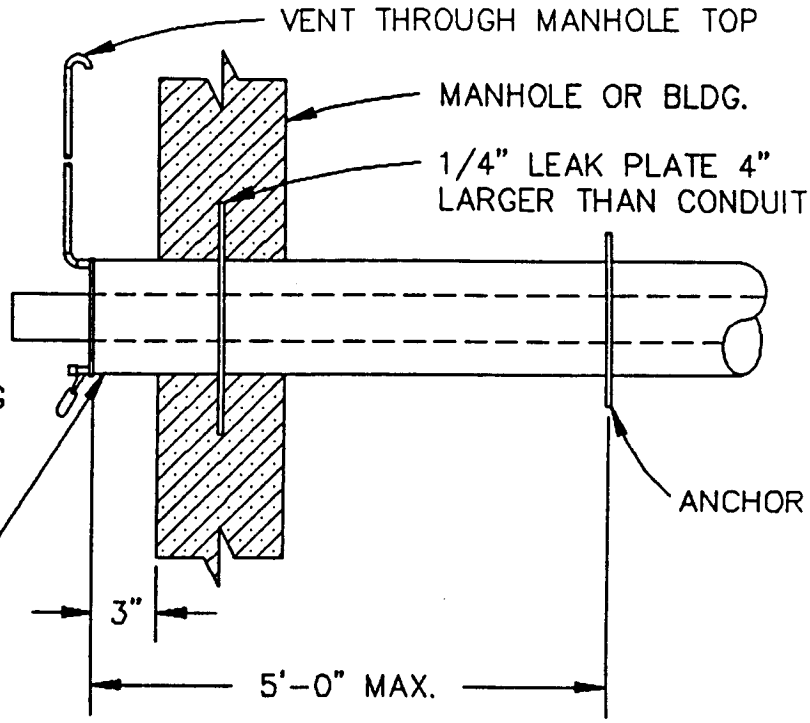
Chief, Construction Division

1" VENT AS SHOWN TYPICALLY ON SK-22 & 23



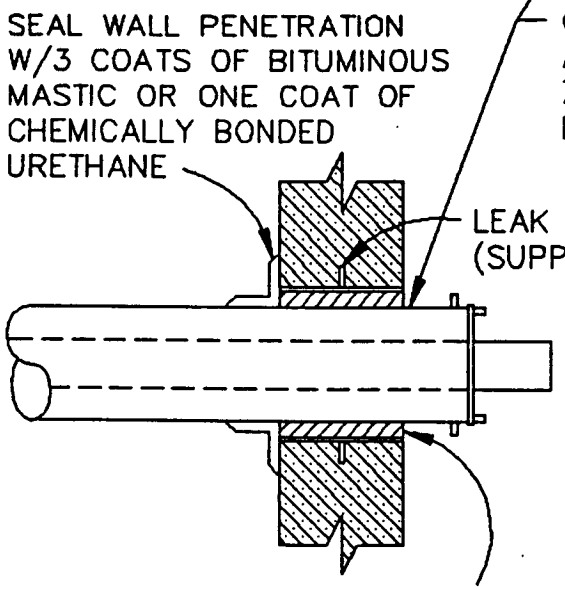
END VIEW

* THERMACOR WILL PROVIDE AN EMBOSSED BRASS OR STAINLESS STEEL CHAIN WHICH SHALL IDENTIFY SYSTEM SUPPLIER'S NAME AND DATE OF INSTALLATION.

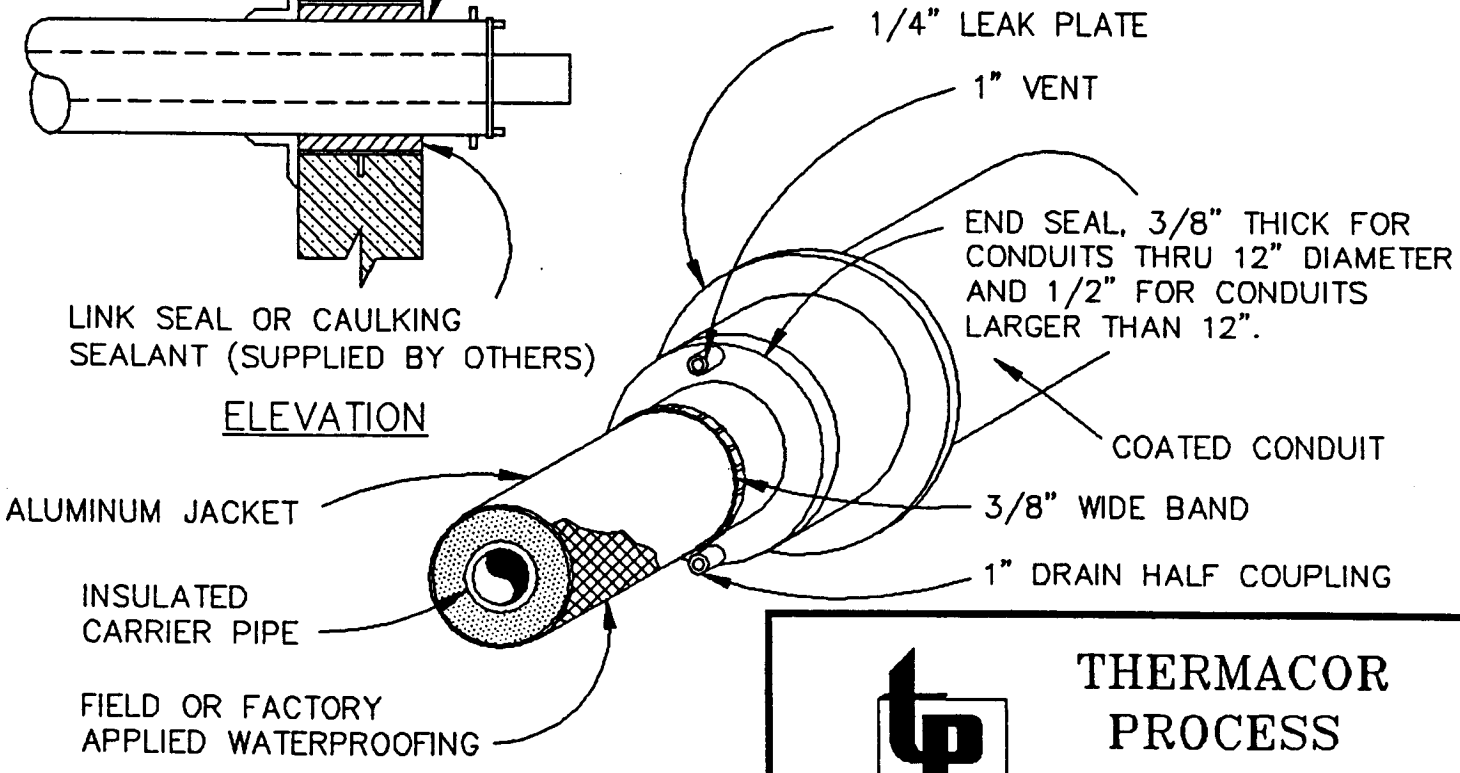


ELEVATION

NOTE: THE CONDUIT WALL THICKNESS SHALL BE A MINIMUM 0.188 INCHES FOR A DISTANCE OF AT LEAST 5 FEET AT EACH MANHOLE ENTRANCE.



ELEVATION



NOTE: USED FOR ALL END TERMINATIONS

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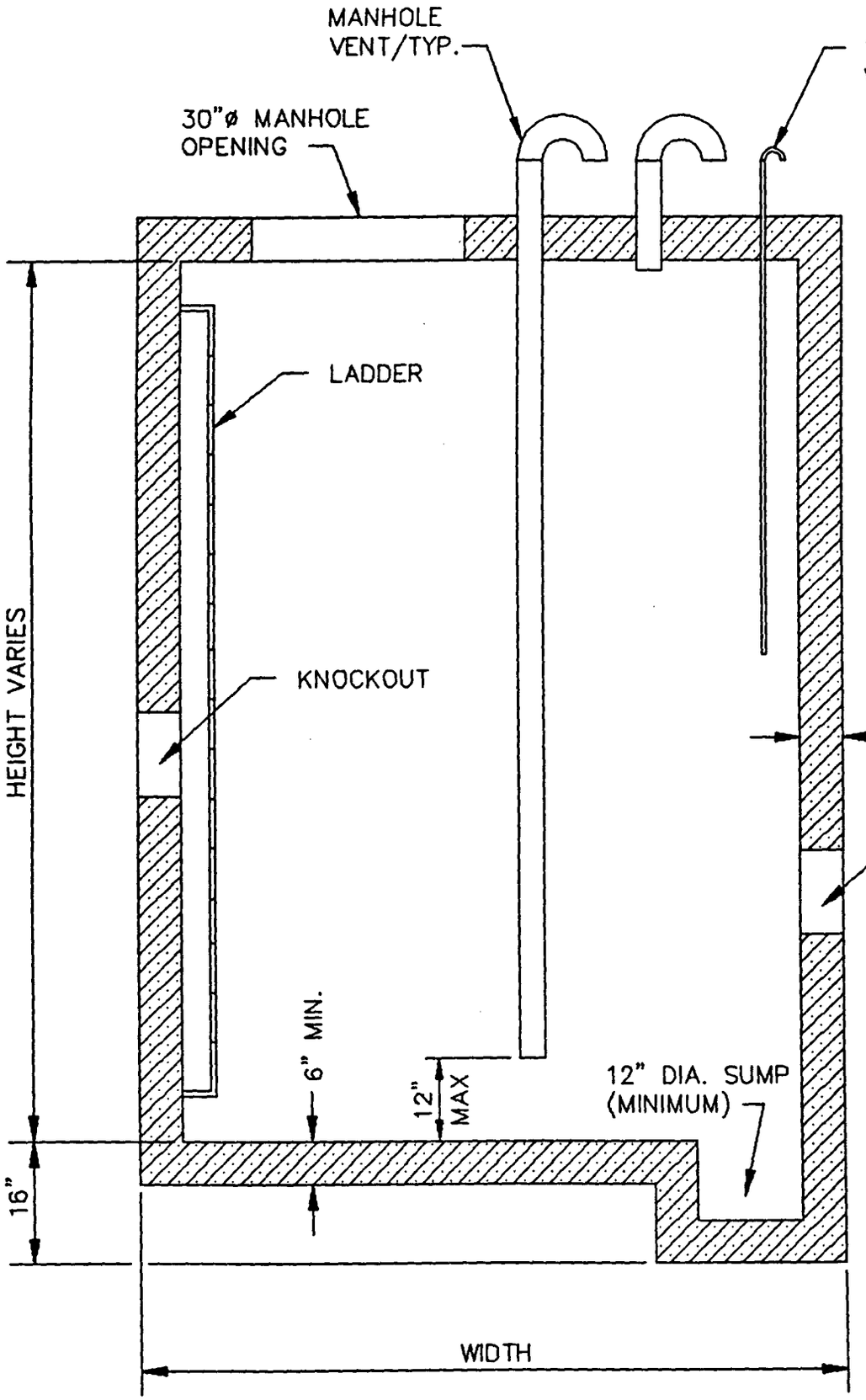
ENCL. 1

TYPICAL MANHOLE/BLDG. WALL PENETRATION W/END PLATE & CONDUIT ANCHOR	DWG. NO. SK-18



PROVIDE KNOCKOUTS IN MANHOLE FOR PIPE STUBS. LOCATION & DIAMETER AS REQUIRED BY FIELD CONDITIONS.

NOTES:

1. CONCRETE MANHOLES SHALL BE REINFORCED WITH #4 BARS–12" O.C. EACH WAY (MINIMUM).
2. MANHOLE COVER TO BE DETERMINED BY FIELD CONDITIONS.
3. MANHOLE EXTERIOR SHALL BE COATED WITH 3 COATS OF BITUMUS MASTIC OR 1 COAT OF CHEMICALLY BONDED URETHANE.

THERMACOR PROCESS INC.

ENCL. 11

CONCRETE MANHOLE (TYPICAL)

DWG. NO. SK–22